4. CAPITAL IMPROVEMENT

The changing environment in which the Washington State Ferries operates, poses many challenges and opportunities. Passenger demands, environmental concerns, regulations, transportation needs, and funding have a major effect. Each impacts the capital requirements of the WSF.

The WSF is facing a daunting task. Its capital facilities – terminals and vessels – are aging and in need of repair and/or replacement. Many terminals have extensive parking problems and need improvements to assure the safe and efficient loading and unloading of pedestrians, vehicles, and bicyclists. Although the WSF has recently built new ferries, four of its vessels are over 70 years old and one has been in service since 1947. Although these ferries are considered safe, they each have single compartments and narrow car deck lanes – unsuitable for today's requirements. The average age of the WSF's vessels and terminals is 30 years.

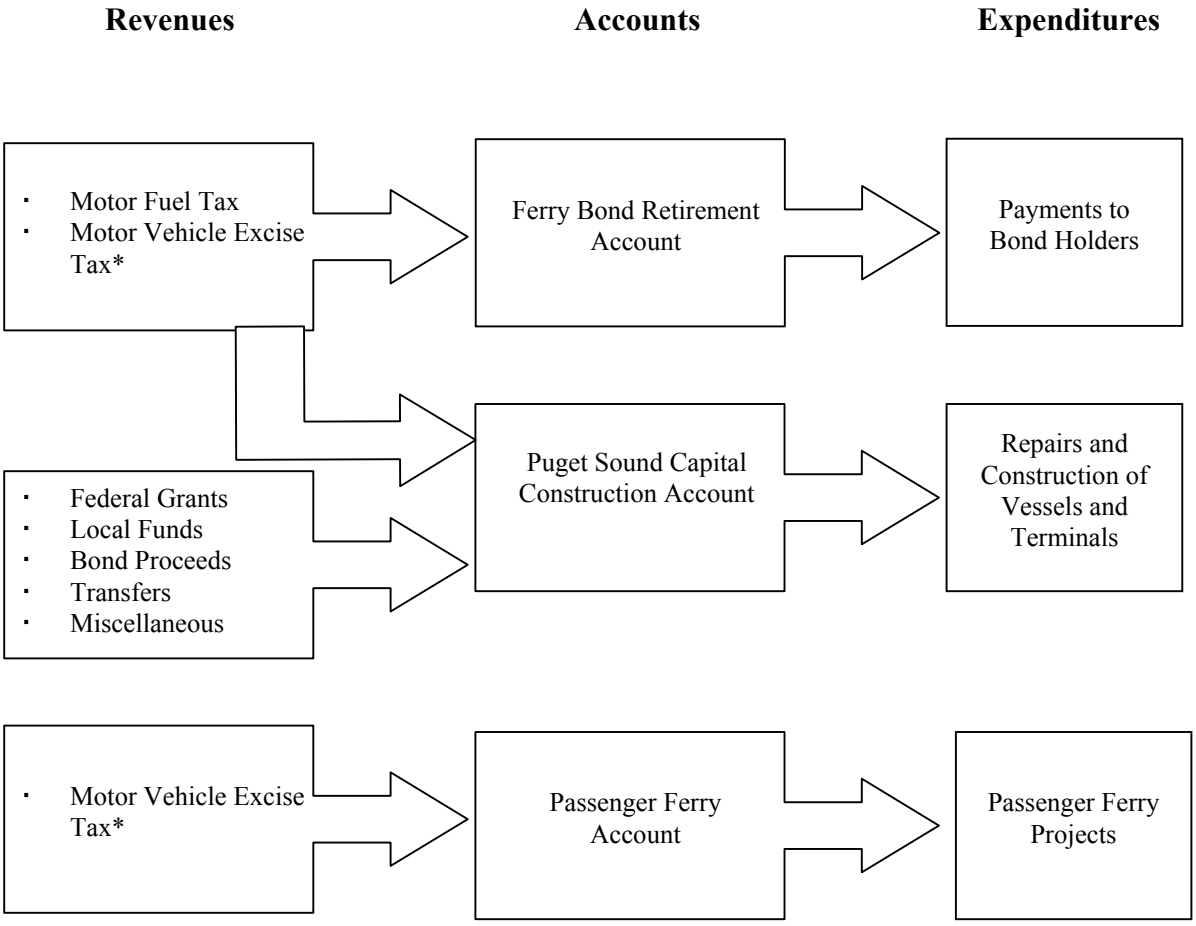
The Washington State Transportation Commission has directed the WSF to protect the public's investments by keeping the Ferries' vessels and terminals in safe and sound operating condition as well as to expand the system to meet growing customer demands. The WSF's construction program has been developed to strategically plan for these changes. Each biennium, the WSF develops a six-year construction program and financial plan and a ten-year capital plan that are submitted to the Legislature as part of its biennial budget request. In its appropriations act, the Legislature approves capital projects and funds as appropriate.

FUNDING

Funding for capital improvement projects comes from a variety of sources:

1999-01 Biennium Revenue and Expenditure Chart

For Ferry Capital Treasury Accounts



* Motor Vehicle Excise Tax distributions for ferry use during the 1999-01 biennium ceased during the second half of FY2000 as a result of the passage of Initiative 695.

Source: WSF

Illustration 4

PRESERVATION AND MAINTENANCE

The WSF capital program focuses on the preservation and new construction of vessels and terminals. These activities are requested through the State's budget process and are approved by the Legislature as capital acquisitions. This is in contrast to routine

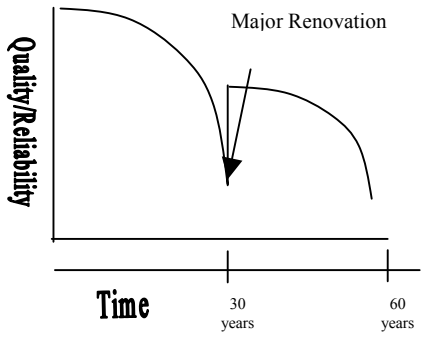
maintenance that is considered an on-going expense and funded through operational resources. The following illustration details these differences:

Repair & Routine Maintenance

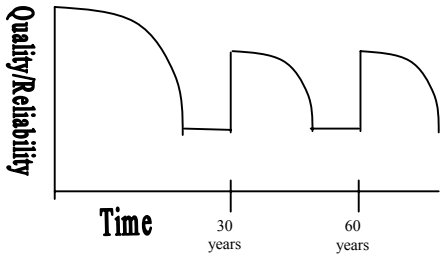
- "If it breaks, fix it."
- 100% Maintenance Department
- Operations Dollars
- Two types:
  1. Replacement In-kind
     Ex. Old pump is replaced by a new one.
     No engineering required.
  2. New Design
     - Design request to Engineering.
     - Specifications, And Plans Developed.
     - Engineering Estimates Developed (Based On Specs And Plans).
     - Budget Estimates Developed (Based On Scope Of Project).
     - Maintenance Approves. (Depending On Dollar Amounts May Be Completed At Eagle Harbor Or Will Be Let For Bid).

Preservation

- Capital Dollars
- Based on Life-Cycle Analysis
- Previous Model:



- Current Model:
  - Conduct major overhauls at shorter time periods to keep costs lower and more even.



- Maintenance Department:
  - Scopes Project
  - Develops Budget Based On Historical Jobs
  - Schedules Based On Availability Of Boat
  - Once Scope Is Determined, Engineering Develops:
    - Specs And Plans
    - Estimates

Source: WSF

Illustration 5

LIFE CYCLE COST MODEL

The Models

Washington State Ferries currently utilizes a life cycle concept to identify investments needed to assure its vessels and terminals are operating in a safe and sound condition. There are actually two life cycle cost models (LCCM) in place - one each for vessels and terminals. The vessel model is currently more complete and further developed than the terminal model. However, both are based on the same principles and should, when fully implemented, provide similar results.

The models are currently supported by a combination of MS Excel spread sheets. The vessel model uses various macro commands where applicable, but in spite of its large size, is simple in design. However, the tremendous number of entries (resulting from the model's generation of a time-related needs base and the inclusion of management's time based spending plans) makes it cumbersome and reporting relatively complex. WSF has developed a plan to migrate to a Microsoft Access database in 2001 that will alleviate this problem. The terminal model, although more sophisticated (a combination of three linked MS Excel spreadsheets) is not as complete. Costs were not available during the recent planning cycle, but are being added at this time. Both models rely on similar components:

- An inventory of the systems and structures on a vessel or at a terminal.
- A priority rating, to determine the relative "importance" of each system and structure.
- An estimate of the life of each system and structure.
- An estimated cost to "renew" the system and structure life.

In years prior to 1996, the major force behind resource allocation decisions was primarily a set of "problem/opportunity" statements which eventually translated into a needs list of capital projects and related costs. The list could be sorted and prioritized, but it was difficult to get a global picture of the needs of the fleet and terminals. In 1996, a consultant[2] was hired to begin the process of implementing life cycles.

Inventory

When the decision was made to implement a LCCM, it was first necessary to catalogue or inventory those major systems and structures that had historically received capital project spending. Today, for vessels, it has been possible to define systems and structures that are identical for the same class and similar for all other vessels. Vessel systems and structures are divided into categories that have been further broken down to individual component systems and structures:

System Categories	Component Systems
Structural Preservation	10
Interior Preservation	5
Steel Replacement	5
Piping Replacement	7
Propulsion System	10
Major Mechanical/Electrical Systems	22
Communications/Navigation Systems	7
Life Saving	2

For example, the five component structures for the category "Steel Replacement" are:

- Hull
- Superstructure
- Auto Deck
- Wet Spaces
- Tanks

Not all vessels contain all systems and structures. There are currently 1,727 systems and structures in the inventory of the 29 vessels in the WSF fleet.

The terminal LCCM inventory has been catalogued in a slightly different manner that more clearly reflects the nature of terminals. Terminals also have categories that reflect groups of terminal systems and structures:

- Dolphins
- Wingwalls

[2] American Management Systems (AMS)

- Towers
- Transfer Spans
- Aprons
- Bridge Seats
- Trestles
- Seawall
- Overhead Loading Facilities
- Passenger-Only Facilities
- Paved Areas
- Systems (e.g., power, lights)
- Terminal Buildings

Within the general structures, it has not been possible to arrive at standard systems and structures for each terminal. Because the size and footprint of terminals differ, the number of systems and structures in a category varies widely from terminal to terminal. The LCCM inventory consists of many systems and structures at each terminal identified within categories by description *and* location. For example, at Anacortes, the description of structures within "trestles" is the following:

- Trestle, timber large - West
- Trestle, timber large - East expansion
- Trestle, tie-up #1
- Trestle, tie-up #2

There are currently 958 separately identified systems and structures in the terminal inventory.

Priorities

Each of the vessel and terminal systems and structures identified in the models are selected according to a series of priorities designed to coincide and support the goals and objectives of the Ferry System. Transportation Commission goals give priority to preservation rather than improvements to service. In the Governor's Ten-Year Capital Plan, categories of funding priority have been established. WSF has assigned a priority of vital and non-vital to each system based on guidelines from regulatory agencies. The

Governor's ten-year funding priorities have been adapted to WSF' budgeting process and prioritized as follows:

Commission Goal	Funding Priority	Regulatory Interest
Preservation of Existing Assets	Emergency Repair	Expedited Capital Investment to Repair Unanticipated Damage (Not Maintenance)
Preservation of Existing Assets	Regulatory Compliance (Safety)	Vital (e.g.: Rescue Boat) Non-Vital (e.g.: Asbestos Abatement)
Preservation of Existing Assets	Continuity of Service (Structural, Mechanical, Electrical Integrity)	Vital (e.g.: Hull Integrity) Non-Vital (e.g.: Topside Paint System)
Preservation of Existing Assets	Quality of Service (Comfort, Convenience, Efficiency, Effectiveness)	Non-Vital (e.g.: Passenger Lounge Amenities)
Improvement of System's Ability to Meet Growth in Travel Demand	Programmatic Change (Mobility Choices and Capacity Increases)	N/A (Access, Connections and Capacity to Move People and Vehicles Through the System)

Vital systems for the vessel model include components that start, propel, or stop the vessel in a safe manner for passengers and crew. Non-vital systems are all other infra-structure items. The systems deemed vital correspond to a series of US Coast Guard regulations found in various sections of "The Code of Federal Regulations, Title 46, etc." There are 850 vital systems and 877 non-vital systems in the fleet's 29 vessels.

Vital systems for the terminal model are structures used to safely land vessels and transfer passengers, vehicles, and cargo. Non-vital systems include all other infrastructure items. The structures deemed vital correspond, generally, to the over-water structures that must be inspected annually by the WSDOT bridges inspectors. There are 547 vital structures and 411 non-vital structures in the 20 WSF terminals.

System/Structure Life

In addition to bearing a priority, each system or structure is assigned a "life." The life is the normal period, in whole years, that a system or structure can be expected to perform in a safe and effective manner. Typically, lives assigned to a specific system on one ship will be the same initially assigned for all ships. When circumstances dictate, a specific system could be assigned a shorter or longer life.

The LCCM is initiated with the year that a system was placed in service or last repaired/replaced. The life assigned is added to that date to determine whether its life-cycle has been exceeded or when its next replacement/refurbishing should be planned. This is a straightforward process that allows WSF to view needs against time. Annual, biennial, six-year, ten-year, and longer time frames are computer generated from this base data.

Estimated Cost

The models will include a best estimate of the cost to replace/refurbish the system or structure. For vessels, the base number is the most recent price charged at the shipyard facility where last repaired, an engineered estimate, or more accurate information from some other source. The vessel LCCM has been used for two budgeting cycles and each time the process has resulted in updates of all pertinent information, including cost estimates.

Costs of individual systems vary widely. The lowest five vessel systems (e.g., vital system water-tight doors) cost less than $50,000. The most expensive five vessel systems (e.g., motors or propulsion controls) average more than $2.4 million. The average cost for all systems in the vessel database is approximately $550,000.

When the model extends costs to a later period, the base cost is increased to reflect total costs in the period when the expenditure is planned. The cost used is calculated by the

model and includes a multiplier for anticipated inflation and an additional 20% for other costs: 6% design engineering, 4% construction engineering, and a 10% contingency. This percentage, derived from historical outcomes, is considered a reasonable approach to accounting for projected inflation and other potential costs. However, the percentage should be modified to reflect more accurate data as the model is perfected and additional outcomes become available.

The terminal LCCM is currently being "loaded" with engineered cost estimates developed by a contracted marine estimator. The model will be updated as appropriate when actual project cost information is developed on completed projects. The costs of individual structures vary similarly to those of vessel systems. The average current cost of a terminal structure project is approximately $880,000.

Structure projects range even more widely than for vessel systems. For example, at the Anacortes terminal, the smallest project, a parking lot improvement[3], is estimated at $12,000. The largest project at Anacortes, a trestle improvement[4], has an estimated cost of over $4.28 million.

Model Maintenance

The integrity of the information developed from the models is directly related to the accuracy of the models' inventory. Because the LCCM has been integrated into how WSF approaches preservation, there is relatively high confidence evidenced by WSF personnel that the models will be routinely maintained.

Vessels and terminals are subject to various third party inspections and are also routinely inspected by WSF personnel. For example, the US Coast Guard conducts frequent

[3] Parking lot D1, Unpaved (Lower lot near toll booths), upland.
[4] Trestle, Timber Large, West.

scheduled and unscheduled inspections of vessels. The Coast Guard requires two dry dock inspections every five years and conducts both annual and quarterly inspections of different scope. When planned inspections or incidents occur that impact lives of a specific system or structure, this information is updated in the LCCM model.

LCCM Utility

The process for using the LCCM in the budget process is the same for both terminals and vessels. The vessel LCCM is explained further to depict this methodology.

The Capital Program Development Manager provides the Director of Maintenance an LCCM-generated printout portraying the current and projected needs of all vessels for the next five biennia. The Preservation Engineer in the Port Engineer's Office reviews the identified needs and vessel availability for shipyard lay-ups. Based on these assessments, the Preservation Engineer develops a work plan of systems and structures that will be preserved in each biennium of the ten-year planning period.

The Preservation Engineer submits the work plan to the Capital Program Development Manager for programming subject to available funding. The information is compared to current law dollars available - funds that have already been committed by statute to WSF by prior legislation. This "current law plan" is further modified to provide a list, by biennium that meets the available budget and provides progress toward WSF goals.

When the budget is adopted, it provides a "project" list for Vessel Engineering. Each project is scheduled and planned shipyard visits are identified. The Port Engineer maintains a four-year visual representation of all planned projects. This detailed planning tool depicts each project by vessel, shipyard, and planned time. What is finally done, may/will change, but any changes will be communicated within an overall plan oriented to stay focused on projects currently identified and in the system.

Washington State Ferries manages and reports on changes in its construction program through updates to the capital plan as well as an end-of-biennium reconciliation. Updated capital requests are submitted to the Transportation Commission approximately four times each biennium for approval. Information copies are provided to the legislative transportation committees and the Governor. Each update provides a project-level explanation of the changes from the previous version of the capital plan.

Ninety days after the end of the biennium, WSF files a formal report to the Transportation Commission, the legislature, and the Governor that measures performance against plan. This report typically describes what was accomplished against approved budgets. Although the approved budget is not a line item budget, major project commitments are tracked and reported against the original obligations WSF made prior to the start of the biennium. WSF uses the end-of-biennium reconciliation and periodic capital plan updates to track original project commitments against final project delivery and to explain the evolution of change in the program during the biennium.

Reporting and Measurement

The LCCM not only supports the capital planning process but also provides a convenient method to measure the performance of the capital program. WSF has developed two performance indicators based on the LCCM analysis – "output" and "outcome."

Program output is measured in terms of the number of systems and structures renewed as a result of capital program expenditures. The standard for success is determined by the number of systems and structures targeted for preservation in the Capital Plan. Success is evaluated through a comparison of the number of items targeted for preservation to the number actually preserved.

Program outcome is measured in terms of the percentage of vessel and terminal systems and structures operating within their life cycle. WSF uses an indicator called the Systems/Structures Condition Rating (SCR). The SCR depicts the current condition of vessels, terminals, or the system as a whole and forecasts the impact various investment strategies are expected to have on the future condition of these capital assets. This is a straightforward description of the physical condition of capital assets in terms of the life cycle status of component systems and structures.

Washington State Ferries uses the SCR to illustrate the impact of investment strategies. Over time, the SCR declines as component systems and structures reach the end of their life cycles. Capital investments renew assets by restoring asset life cycles. Therefore, the SCR can be used to measure preservation needs and develop investment strategies to maintain or improve the condition of assets.

To further assist policymakers in making resource allocation decisions, WSF typically subdivides a condition rating into two selective condition ratings – one for vital systems and structures and one for non-vital assets.

The SCR can be used as an extremely effective resource management tool. The Transportation Commission recently adopted a budget request and ten-year capital plan based on these condition ratings. The ten-year capital plan proposes to use available revenue to raise the SCR for vital systems and structures to 90%. To accomplish this, the Commission restricted resources for non-vital systems and structures – a decision that will result in a decline in the non-vital SCR over the ten-year period. However, the Commission also intends to use any new revenue to reverse the decline in the non-vital SCR – improvement dependent on the amount of new revenue available. These decisions were made based on information provided by the SCR.

The LCCM provides a means of measuring and reporting the performance of the capital program. The output indicator provides a traditional way of measuring performance –

work units promised vs. work units delivered. The outcome indicator is measured in terms of condition ratings that are directly related to capital investment needs analysis. As a result, WSF's capital program outcome measure shows progress towards meeting program needs.

Evaluation

The life cycle cost model, and the processes used to perfect it, have a wider applicability to WSF than simply capital budgeting. The LCCM is supported by the operating entities within WSF and becomes a significant communication tool for operations. It helps management stay focused on priorities related to capital spending and resource allocation.

The major outcome performance measure of the Systems/Structures Condition Rating plays a critical role in the WSF investment process. It describes the current and projected condition of assets as they are impacted by unfavorable life cycle deterioration and favorable preservation investments. The SCR portrays this information as a percentage measure using counts of systems and structures, e.g., the number of systems and structures operating within their life cycle divided by the total number of systems and structures. By using this methodology, WSF is able to quantify the need to preserve assets and to reflect the outcome of alternative investment plans.

Although the SCR is an extremely valuable resource management tool, it has a weakness. It effectively quantifies the amount of work needing to be accomplished but does not size the economic value of the work needing to be done. For example, costs to preserve individual vessel systems vary widely. The lowest five vessel systems cost less than $50,000 while the most expensive five vessel systems average more than $2,400,000. The average cost for all systems in the vessel database is approximately $550,000. If WSF's work plan focuses on high cost items, program expenditures will yield a very modest improvement in the SCR. Conversely, if WSF's work plan focuses on low cost

items, program expenditures will yield substantial improvements in the SCR. When measuring the impact of aggregate spending in the next biennium, and in six, ten, or more years, it is important to give weight to what the dollar expenditures can buy.

An SCR that is solely based on the number of systems and structures preserved is not adequate to provide the requisite economic information. Another outcome measure is needed to capture the economic dimension. This additional measure, an Economic Condition Rating (ECR) can be obtained by weighting the systems and structures by their life cycle costs. An ECR would provide an outcome indicator in terms of economic value represented by those systems and structures.

Weighting the current SCR by the total dollars of systems and structures within life cycle would provide an effective tool for measuring the impact of expenditures on fleet and terminal readiness. A weighted SCR would provide an indication of the dollar backlog represented by those systems and structures out of life cycle at a point in time. Trending such an indicator would provide a global overview of how well spending decisions are impacting WSF.

Washington State Ferries' life cycle cost models will soon be able to implement an ECR. The LCCM can support an ECR provided the models contain all cost data for preservation of vessel and terminal systems and structures. The vessel LCCM currently contains this data while the terminal LCCM is in the process of being completed. Once this is accomplished, WSF should be able to supplement the SCR with an ECR.

RECOMMENDATION #1

We recommend Washington State Ferries use a modified version of the current SCR, weighting it by life cycle costs of systems and structures, to indicate an economic condition rating (ECR).